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A META-ANALYSIS OF THE REPORTED PREVALENCES OF GASTRO INTESTINAL INFECTIONS AMONG SCHOOL CHILDREN IN NIGERIA: A REVIEW

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ABSTRACT

The prevalence of Intestinal parasitic infections is reported to be high among children in Nigeria. This might be due to the fact that their immune system is still in the formative stages and very vulnerable to attack. The effects of GIT infection in children which include trauma, nutrition-robbing and poisoning, change in resistance, and immune impotence etc. Parasites frequently encountered are *Ascaris lumbricoides*, *Trichuris trichiura*, *Strongyloides stercoralis* and others. Information for this review was sourced online from Google search, PubMed and EBSCO websites. Key words used for the search included, Prevalence, Intestinal parasites, GIT infections, Nigeria, intestinal helminthes, school children. After several input of key words, 400 articles were generated from the search. Data was extracted using Microsoft Excel spreadsheets. Meta-analysis was performed using STATA 13.0. Our meta-analysis shows that the statistical significant prevalence of GIT infections among Nigerian school children is 0.42 (95% CI: 0.33 – 0.51), $Z=13.87$, $p<0,001$. Result of this research suggests that more needs to be done by the health authorities in charge of schools. Pupils need to be given a regular, periodic and effective dose of health education talk with emphases on hand-washing, wearing of shoe/sandal and personal hygiene. There should be improvement in supervision of activities of students while in school with school authorities being prevailed upon to provide clean and decent surroundings for the children. Schools should also ensure proper accreditation for food vendors to prevent their spreading infection to students.

KEYWORDS: Prevalence, GIT Infections, School Children, Nigeria, Meta-Analysis

BACKGROUND

Prevalence of Intestinal parasitic infections is reported to be high among children in Nigeria because of their vulnerability and are known to cause effects in children which include trauma, nutrition-robbing and poisoning, change in resistance, and immune impotence. (Abah and Irene, 2015). Parasites frequently encountered are *Ascaris lumbricoides*, *Trichuris trichiura*, *Strongyloides stercoralis*, and hookworm species (Abah and Irene, 2015)

More than one billion of the world's population, including at least 400 million school children are chronically infected with *A. lumbricoides*, and *T. trichiura* according to the WHO (Awolaju and Morenikeji, 2008). Intestinal parasites are parasites which are said to populate the intestines (Oyeniran et al 2014). It is estimated that 60% of the world's population is infected by one intestinal parasite or the other (Muhammad et al, 2014). Gastro-intestinal parasites are identified as a cause of morbidity and mortality throughout the world particularly in the under developed countries (Gimba and Dawam ,2015). Developing countries have a high prevalence of intestinal parasites and this could be due to conditions of poor hygiene as well as poor personal sanitation (Muhammad,2014).

Intestinal parasitic diseases remain a serious public health problem in many developing countries especially due to fecal contamination of water and food (Gimba and Dawam ,2015) The major protozoan parasites, which have been implicated include *Cryptosporidium spp.*, *Giardia lamblia*, *Entamoeba histolytica*, and *Cyclospora Cayetanesis*, helminthic parasites include *Ascaris lumbricoides*, hookworms (*Necator americanus* and *Ancylostoma duodenale*), and whipworm (*Trichuris trichiura*). These parasites are widespread in the environment and cause most gastro-intestinal diseases. (Ishaku et al 2013). Intestinal infections are transmitted mainly through the fecal and oral route with food and water being the main source of these infections (Ishaku et al 2013).

Intestinal parasitic infections are asymptomatic in some people while the infections are symptomatic in others. Symptoms according to the WHO depend on intensity of infection and they could include coughing, cramping, abdominal pain, bloating, flatulence and diarrhea. In more serious cases people have diminished sex drive, skin-itching, fever, nausea, vomiting or bloody stools may occur. Some parasites also cause low red blood count (anemia) and some migrate to the lungs to the intestinal or vice versa and other parts of the body making laboratory tests important for identification of organisms. However, because many parasitic infections especially those of helminths origin are

usually asymptomatic or produce only mild symptoms, they are often neglected until serious complications or chronic clinical pictures appear (WHO,2002). Undiagnosed as well as asymptomatic carriers has been a major source of contamination to the environment thereby compounding the problem (Oyeniran et al, 2014).

In Sub-Saharan Africa, intestinal helminthes infections are common and of major health concerns because factors that predispose humans to these infections include poverty, poor sanitations, ignorance, contaminated food or water, environmental hygiene and malnutrition prevail (Chioma et al ,2015). Children playing in the sand results in very widespread infestation with a variety of helminths and eating habits that involve the consumption of raw vegetables, fish, crustaceans and meat allow the transmission of helminthes infection. Scholarly estimation indicates that soil transmitted helminthes is among the most common of all parasitic infections (Chioma et al ,2015). The World Health Organization declared 1981–1990 the sanitation decade and the state Governments in Nigeria approached the issue by declaring a monthly National Sanitation as a means of improving the sanitary condition in towns and villages in the country. The Sanitation policy of the government is ongoing in many cities and towns in Nigeria. (Abah and Irene ,2015)

The aim of this review was to conduct a meta-analysis on the prevalence of intestinal infection among school pupils in Nigeria, as this will provide additional information for health planners in the country. The review will help health providers as well as government agencies in evaluating and setting up appropriate programs/measures to bring about a drastic reduction in the prevalence of these infection among school children. School children happen to be the most vulnerable group prone to these particular kind of infections.

DATA EXTRACTION AND INCLUSION CRITERIA

The information for this review was sourced online from Google search, PubMed and EBSCO websites. Keywords used for the search include, Prevalence, Intestinal parasites, GIT infections, Nigeria, intestinal helminthes, school children. After the several input of key words, 400 articles were generated from the search. Selection criteria such as literatures with a minimum sample size of 50 participants since results of smaller studies are more likely to be inconsistent with larger studies, literatures relevant to the topic and published between 1997 and 2016 were used in the abstract selection of 30 articles. These 30 articles underwent further shifting process vis-a-vis the topic of this

narrative review and resulted in the final identification and selection of the 21 articles used in the meta-analysis.

STATISTICAL ANALYSIS

Data was extracted using Microsoft Excel spreadsheets. Meta-analysis was performed using STATA 13.0 (Stata-Corp, College Station TX). We used random-effect model to estimate the pooled prevalence of GIT infections among Nigerian School Children which takes into account both the within-study and between-study variability. In relation to fixed-effect model, random-effect was considered appropriate in the present study due to the test statistics showing evidence of heterogeneity among studies. We examined the effect of small number of study on the pooled prevalence using the Egger's test. In addition, we estimated heterogeneity using I-square statistic, which estimates the proportion of total variance that can be attributed to between-study variance. All analyses were performed at 5% level of significance.

RESULTS

This review included twenty-one studies involving a total of 9,993 participants in the meta-analysis as shown in Table 1 which depicts the characteristics of included studies. The number of participants in each study ranged from 52 to 3,826. The studies spread across the country including the Federal Capital Territory (FCT), Abuja.

Our meta-analysis shows that the statistical significant prevalence of GIT infections among Nigerian School Children is 0.42 (95% CI: 0.33 – 0.51), $Z=13.87$, $p<0.001$. Figure 1 illustrates a forest plot depicting the estimated prevalence of GIT infections from individual studies as well as the overall prevalence with their respective 95% CI.

There was a significant evidence of heterogeneity between studies ($Q=1606.65$, $df=20$, $p<0.001$, $I^2=98.76\%$). We found no significant evidence of publication bias based on Egger's Test (intercept=0.344, [95% CI: 0.167 – 0.522], $p=0.348$).

DISCUSSION AND CONCLUSION

Intestinal parasitic infections can cause vomiting, diarrhea, anorexia, abdominal pain and nausea which may lead to reduced food intake, causing reduced nutrient availability hence contributing to under nutrition in children (Kpurkpur et al, 2016). Morbidity due to intestinal parasites has always been an important public health problem in the tropics, but the incidence and severity may vary depending on the location and period of time (Akingbade et al, 2013). Parasitic infestation is still a major public Health problem in Nigeria children and the severity of the problem is as a result of the quality of living standard, environmental sanitation as well as socio-economic factors like large

family size, inadequate child care and poor dietary practices (Oyeniran et al, 2014). Within this study we do see a wide spread of the infections among school children all the 6 geopolitical zones that make up the country as reported by the varied levels of prevalence reported in these analyzed studies. The reported prevalence of these infections differ from state to state but we can conclude that there a moderate to high level of prevalence in GIT infection in every state covered by the scope of this study, more in some states than in others.

The nature and mode of transmission of these infections show that they can affect a wide variety of individuals but this study has its focus on prevalence of these infections among school children.

Our meta-analysis shows a fairly moderate prevalence of GIT infections among school children in Nigeria despite the impact of heterogeneity of GIT infection prevalence across the country. The overall prevalence within our study is about 42% which is in consonance with results obtained from certain individual studies done by different authors on this subject. Awolaju and Morenikeji (2009) reported a prevalence of 45.5% among their study participants. Alo et al (2013) reported an incidence of 57.2% within their study while Awoyeni et al (2015) reported a prevalence of 53%. Chioma et al (2015) within their study reported a prevalence of 44.7%.

Results of this research suggests that more needs to be done by the health authorities in charge of schools. Pupils need to be given a regular, periodical and effective dose of health education talk with emphases on hand-washing, wearing of shoe/sandal and personal hygiene. There should be an improvement in supervision of activities of students while in school with school authorities being prevailed upon to provide clean and decent surroundings. It is important for school authorities and parents to embark on regular de-worming, provision of toilets at homes and schools and improved sanitary disposal of human wastes among the pupils and others in the communities to reduce the spread of soil transmitted infections.

Regular screening of students on a nationwide basis can also be embarked upon by either NGOs or the Federal and state government health authorities. This will help to provide a baseline data that can be used to measure if progress is being made in the fight against these kind of infections. Food vendors within the school premises are also important stakeholders in the quest to reduce the burden of GIT infections within schools. Proper handling of food and personal hygiene and sanitation is important so that school food vendors do not infect children with these parasites.

LIMITATIONS OF OUR STUDY

Given the findings of this study, it is important to note some limitations of our study. The relatively small number of articles also limits the ability of the Egger's test to demonstrate publication bias. There were relatively few articles that examine

age-specific prevalence and this prevented us from performing stratified subgroup analysis based on age. Also, further research needs to be done to accommodate out of school children so that we can have a robust prevalence of GIT infections among Nigerian children.

Table 1: Characteristics of included studies

Author	Year of Publication	Study Location	Number Infected	Sample Size
Abah & Arene	2015	Rivers State	1059	3826
Agbolade et al	2007	Ogun State	701	1059
Akingbade et al	2013	Ogun State	31	120
Alo et al	2013	Ebonyi State	186	325
Awolaju & Morenikeji	2008	Osun State	151	312
Awoyeni et al	2015	Osun State	106	200
Babatunde et al	2013	Kwara State	171	413
Umeh et al	2015	Anambra State	186	416
Cletus et al	2013	Enugu State	143	242
Gimba & Dawam	2015	FCT-Abuja	42	150
Kirwan et al	2009	Osun State	48	369
Oguanya et al	2012	Edo State	49	200
Ojurongbe et al	2014	Osun State	75	162
Simon-Oke et al	2014	Ondo State	88	180
Oluboyo et al	2014	Anambra State	31	272
Kenneth et al	2012	Akwa Ibom State	273	405
Olusola et al	2015	Osun State	10	52
Oyeniran et al	2014	Osun State	363	505
Samaila et al	2016	Bauchi State	10	110
Kpurkpur et al	2016	Benue State	215	418
Damen et al	2011	Borno State	208	257

Prevalence of GIT Infections among school Children in Nigeria

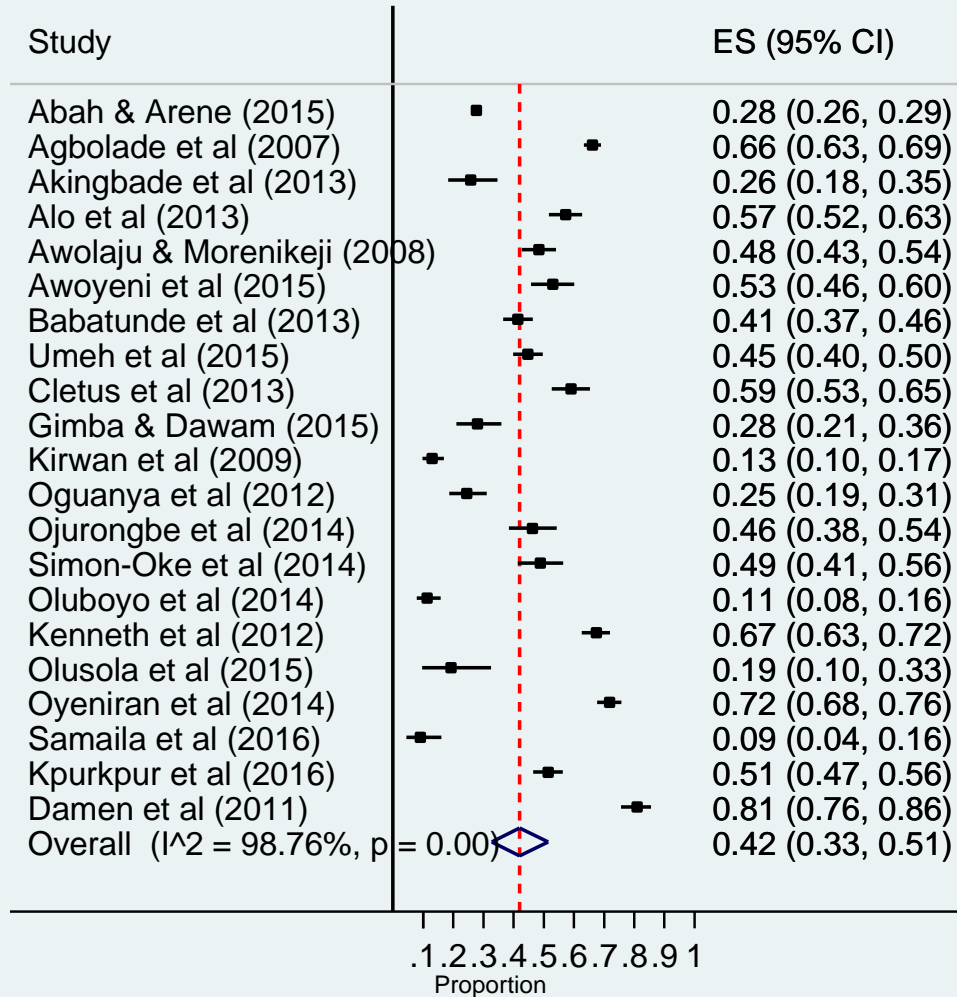


Figure 1. Prevalence of GIT infections among school children in Nigeria

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